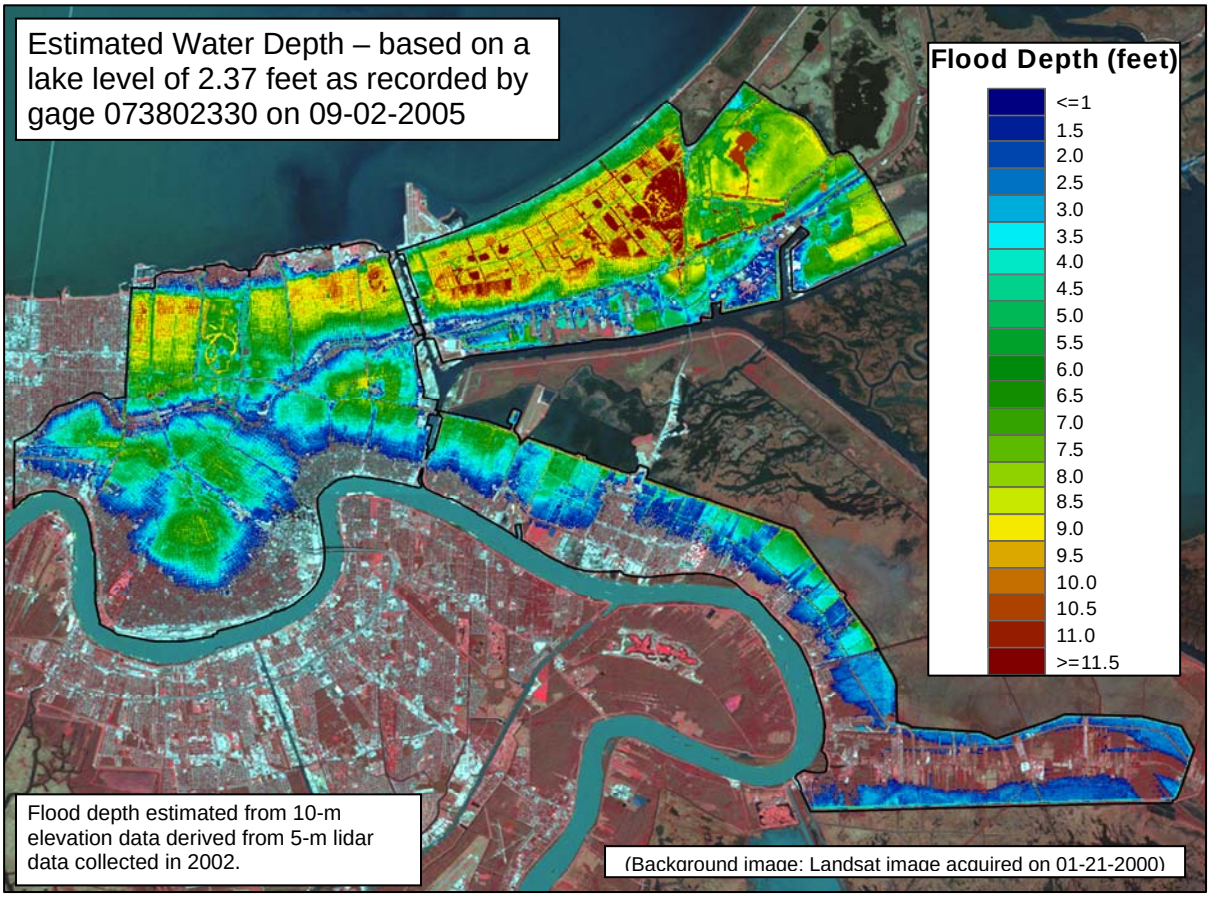
Topography-Based Analysis of Hurricane Katrina Inundation of New Orleans

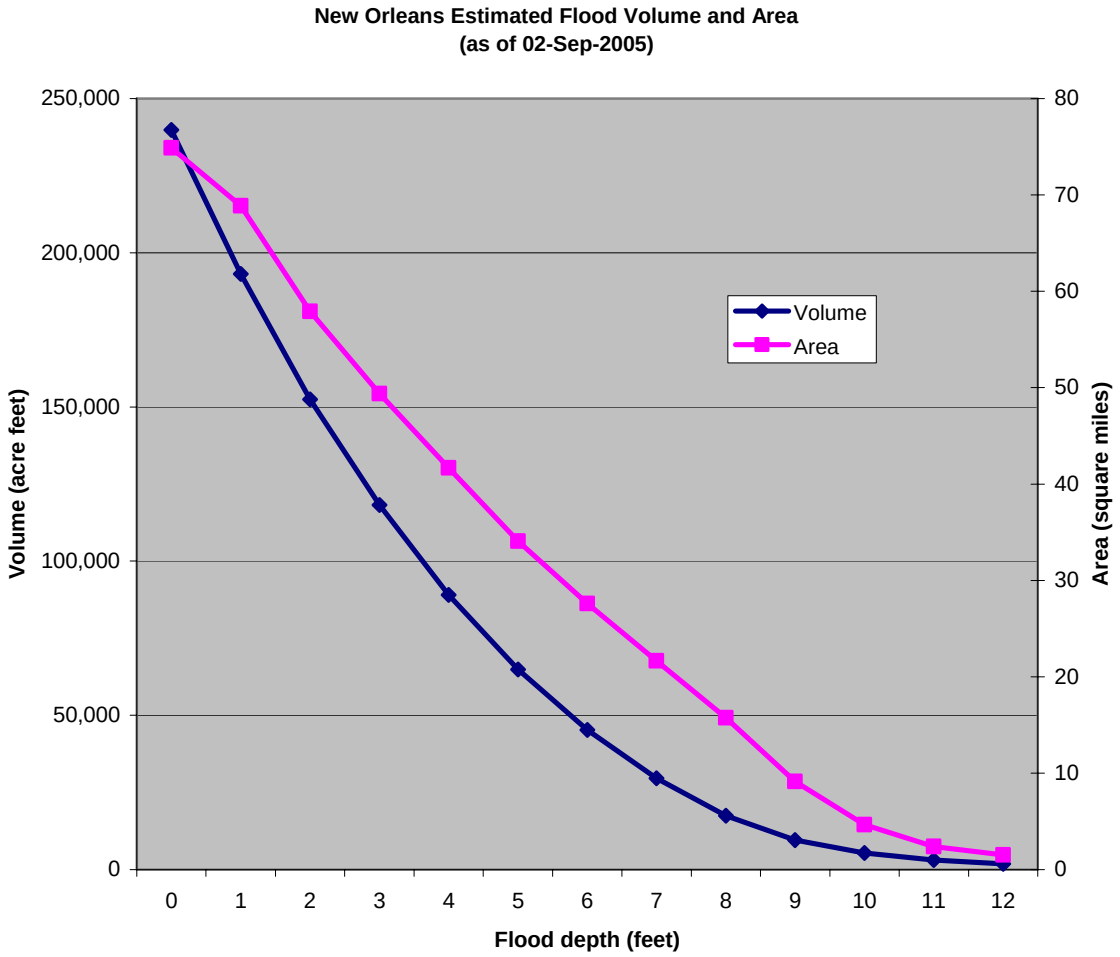
High-resolution, high-accuracy elevation data derived from lidar data collected in 2002 have been used extensively during the first weeks of recovery from Hurricane Katrina. The precise topographic measurements provided by lidar have proven very useful for various mapping activities in the low relief environment of New Orleans.

The graphic below was produced at USGS/EROS using the 2002 lidar data. Because an accurate delineation of the inundated area from remote sensing data was not yet available, the flood water level within the city was derived from a lake level gage on Lake Pontchartrain, with the assumption being that the level of the lake and the flood waters had equalized by the afternoon of Friday, September 2, 2005. Comparison with subsequent imagery has shown the flood delineation to be a reasonable depiction.



The lidar data have also been used to derive estimates of flood water volume. The work to produce a flood capacity curve was done at the request of the USGS Office of Surface Water, which was responding to an inquiry from the Corps of Engineers to provide independent corroboration of their estimates. Accurate estimates of flood volume are needed to project the length of time required to remove the water from the city.

The graph below displays the estimated volume and surface area of the flood waters at 1 foot increments. Note that the volume and area estimates are only for the areas shown as inundated on the above graphic. The depths are relative to the water surface as of the afternoon of Friday, September 2, 2005. The volume and area of flood waters have decreased since that time as pumping operations have been initiated and are ongoing.



These data are provisional, have not been verified or validated with ground-based information, and are subject to revision. However, this application demonstrates the usefulness of highly detailed topographic information for inundation mapping and analysis.

By combining the precise elevation information from lidar with accurate ground-based water level information and remote sensing derived inundation delineations, a complete history of flooding and de-watering can be reconstructed. Such a history will be useful for assessing the effect of the flooding on urban land cover. For example, the effects of depth and length of inundation upon urban vegetation land cover classes can be assessed. Likewise, the effects of varying inundation conditions on different types of structures can be documented.

Another use of an understanding of the effects of inundation over time on the urban environment will be to help in planning reconstruction of infrastructure. If a detailed hydrologic analysis shows specific inundation duration patterns, then structures can be rebuilt in a way that mitigates impacts from future storms. The inundation history and conditions can also be used to test how accurate pre-storm planning simulations have been, and to make appropriate modifications to future modeling scenarios.